vatory, had visited the principal observatories in England and America, and the workshops of the first instrument makers in these and Continental countries. The site of the observatory, of which the foundation-stone was laid in June 1874, is a plateau of between 14 and 15 acres at an elevation of about 200 feet above the mean level of Vienna. The observatory is 330 feet long in the direction of north-south, and 240 feet in that of east-west. It is hoped that the building will be completed in 1877, and Dr. De la Rue, judging from the progress which had been made when he visited it in October last, believes it will be ready to receive the instruments at that time.

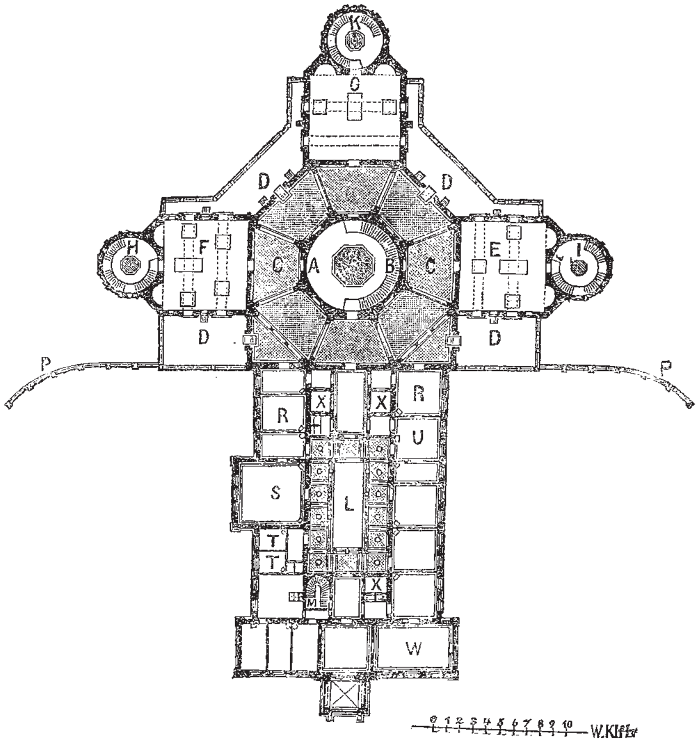

Fig. 3.—It will be seen that the first floor of the director's house is on the same level as the ground floor of the observatory ; the apartments of the assistant astronomers are on the ground floor. C C show the section of the gallery surrounding the ground-floor of the great dome ; L, the section of the staircase. Referring again to Fig. 2, W is the director's house in plan ; S and T T, the library ; U, the lecture theatre ; and lastly, R, the offices.

The principal instrument of the observatory will be a refractor of about 26 inches aperture, to occupy the central dome of 42 feet internal diameter, both of which, as well as three smaller domes, two of which are shown in Fig. 1, are being constructed by Mr. Howard Grubb of Dublin. One of these smaller domes will contain an equatorial refractor of 12 inches aperture, by Mr. Alvan Clark, of Cambridgeport, Mass. "These two instruments, together with a meridian circle having a telescope of 8 inches aperture, and augmented by the instruments in the old observatory, will constitute the first equipment of the new establishment. Later on it is intended to place in the third dome an equatorial reflector specially adapted for photography, and also a prime vertical instrument in the room near the fourth dome, to the north of the central dome."

One arrangement, which Dr. De la Rue, with some justice, considers a drawback to an otherwise admirably arranged establishment, is that the buildings comprise the dwellings of the director, and apartments for the assistant astronomers. Although this arrangement will no doubt add to the comfort of the astronomers, "it would have been," Dr. De la Rue says, "in my opinion, preferable for the dwellings to have been detached, as the heated air emanating from them will be liable to disturb the definition of the instruments." We hope, however, that practically no real inconvenience will arise from this arrangement.

"From the preceding description it will be seen," Dr. De la Rue concludes, "that Austria will not be left behind in the steps which are being taken to promote physico-astronomical observations ; and I sincerely hope that our own Government will ere long adopt measures to ensure to England a fair chance of honourably competing in the advancement of that branch of astronomical science which the Fellows of this Society have done so much to promote mainly from their own individual resources."

THE ROYAL SOCIETY COMMITTEES

FEW outsiders are aware of the amount of administrative work done by the Royal Society by means of its numerous committees. The work in this direction done during the past year is so well set forth in the recent anniversary address (just published) of the president, Dr. Hooker, that an abstract of it will no doubt be interesting to our readers. The principal committees are the Eclipse Committee, the Transit Naturalists' Committee, the Arctic Committee, and the *Challenger* Committee.

The first enterprise referred to by Dr. Hooker was the Arctic Expedition, in the scientific equipment and instructions of which the Royal Society took an important part. Referring to the cruise of the *Valorous*, Dr. Hooker stated that it was through the representations of the Royal Society that Mr. Gwyn Jeffreys and an assistant were appointed to carry on temperature soundings and deep-sea dredging.

"Capt. Loftus Jones and Mr. Jeffreys dredged on the Greenland coast from 70° 30′ N. lat. to the entrance of Davis's Straits, and in the Atlantic as far as 25° 58′ W. long., in depths of which the greatest was 1,785 fathoms; and temperature-soundings were taken at eleven out of the twenty stations indicated in the Admiralty Instructions.

"Among the valuable results obtained are the fact that the fauna of the Greenland seas agrees with its land flora in being mainly Norwegian, there being (with the exception of the Echinoderms) an absence of many North-American forms, which, as it appears, have not been found eastward of the meridian of Cape Chidley in Labrador. A remarkable mollusk, previously dredged at a depth of about 1,000 fathoms off the coast of Portugal by the *Porcupine*, and which, when first found in a fossil state in the newer tertiaries of Sicily was supposed to be an extinct type, reappears in the deep waters of Davis' Straits ; and a *Campanularia* was found, specifically identical with one discovered this year in the opposite hemisphere, viz. in Kerguelen's Land, by Mr. Eaton, the naturalist of the Transit of Venus Expedition to that island. A most singular sponge-like diatom, named by Dr. Dickie *Synedra Jeffreysi*, with living *Globigerinæ* entangled in the colloid collecting-matter of its frustules, was taken in the towing-net.

"The existence of a remarkable elevation of the floor of the ocean was ascertained in lat. 56°N., long. 34°42′ W., where soundings of 690 fathoms were obtained between depths of 1,450 fathoms on one side and 1,230 fathoms on the other—an interesting fact when taken in connection with H.M.S. *Bull-dog* having found a similar elevation in lat. 59° 40′ N. and long. 29° 30′ W. It makes known the probable existence of a sub-oceanic ridge running N.E. and S.W. between Great Britain and Greenland."

With regard to the Transit of Venus Expedition, Dr. Hooker referred to the results obtained by the naturalists, who, on the recommendation of the Council, were appointed to accompany the expeditions to Rodriguez and Kerguelen's Land ; in the former case Messrs. Balfour, Gulliver, and Slater, and in the latter the Rev. A. E. Eaton. With many of the results obtained by these naturalists our readers have already been made acquainted.

Rodriguez, Mr. Balfour has shown, is, after all, a volcanic island, possessing neither granite nor sandstone, but composed wholly of igneous rocks, with patches of coralline limestone along the coast. It belongs, therefore, geologically and geographically, to the Mascarene group. The general characters of its fauna and flora approximate very closely to those of the Maurician group, upwards of 300 miles westward. Dr. Hooker then referred to the remains of extinct birds, including those of the Solitaire, and of extinct tortoises, which have been found in Rodriguez. Mr. Slater is of opinion that both classes of remains were entombed subsequently to the visits of Europeans. With regard to Mr. Balfour's Report on the Flora of Rodriguez, Dr. Hooker stated it as a very remarkable fact that one of the two new genera of flowering plants which have been found belonging to the natural order Turneraceæ, is most closely allied to a peculiar Panama genus; and that one of the new species has only a single congener, which is a Pacific Island plant.

Mr. Eaton's Report on the Natural History of Kerguelen's Land we have already given at length in vol. xi. pp. 35, 75. Full information as to the results obtained by all the naturalists will be published, and, after a complete set has been reserved for the National Collections, the remaining specimens will be distributed. The total expenditure incurred was 1,512*l.*, of which 1,396*l.* has been contributed by Her Majesty's Government, and the rest has been defrayed out of the Donation Fund.

With respect to the Total Eclipse Expedition of April, 1875, Dr. Hooker speaks as follows:—

"Towards the close of last year (1874) the desirability of observing the total eclipse of the sun, which was to take place in India, engaged the attention of your Council; and the subject was under its consideration when a letter was received by me from His Majesty the King of Siam, offering hospitality and assistance should the Royal Society deem it expedient to appoint scientific men to observe it from His Majesty's dominions.

"Your Council being of opinion that both the importance of the occasion (totality during this eclipse being of longer duration than during any other that would be observed in the present century) and the liberal offer of His Majesty required careful consideration, appointed a committee of five astronomers and the Society's officers to report upon the feasibility of undertaking such an expedition with a reasonable prospect of success. The Committee was advised that no time was to be lost in arriving at a conclusion, as only four months would elapse before the occurrence of the eclipse.

"The first step taken was to communicate with the First Lord of the Treasury and the Secretary of State for India, and ascertain whether, should the attempt be made, Her Majesty's Government would be disposed to co-operate with the Society.

"The answers were most favourable; but still grave doubts were entertained by several of the Committee as to whether it were possible to make the necessary preparations and arrangements with sufficient completeness to secure adequate results.

"After much deliberation it was decided in the affirmative, the Committee's decision being based on the following favouring circumstances:—That confidence in its feasibility was expressed by those members of the Committee who had themselves conducted or accompanied eclipse expeditions in foreign countries; that two eminent observers, Messrs. Janssen and Tacchini, were already in India and their services available; that Her Majesty's Government would co-operate by proposing to Parliament a grant in aid of 1,000*l.*, which would be augmented by another of 300*l.* from the Donation Fund of the Society; that the Secretary of State for India and the Governor-General of India had promised active co-operation by sending an expedition to the Nicobar Islands, where, as well as in Siam, totality would be visible; that both the Indian Government and the Admiralty had granted passages in their vessels, and that the Peninsular and Oriental Company had offered to give passages to the observers and their assistants at greatly reduced rates; that His Majesty the King of Siam would defray all expenses of the party sent to his territories; and lastly, which perhaps weighed most with the Committee, was Mr. Lockyer's disinterested offer to superintend all the arrangements of observers and instruments, to prepare the instructions for their guidance abroad, and to make all the necessary telegraphic and other communications with India and the Straits Settlements previous to, and during the progress of the expedition.

"As in the case of former eclipse expeditions, invitations to take part in the observations were addressed to foreign men of science distinguished for their researches in solar physics; but Prof. Tacchini was the only one who could accept. At the same time Dr. Vogel, of Berlin, a well-known photographer, was asked to assist, and he accompanied the expedition.

"A communication was received from M. Dumas, the perpetual Secretary of the Paris Academy of Sciences, with reference to Mr. Janssen's proposed observation of the eclipse; and instructions were sent to Singapore that every assistance should be afforded to that distinguished physicist.

"As a final result of these preliminary arrangements, there were two strong parties in position on the morning of the 6th of April, of whose members no less than six were sent out from England. One party, a combination of Italian, Indian, and English, went to Camorta in the Nicobar Islands; the other, French and English, made their way to Chulai Point in Siam. In the first party were Prof. Tacchini, Capt. Waterhouse, Prof. Pedler, Dr. Vogel, and Messrs. Meldola and Reynolds; in the second were Dr. Janssen, Dr. Schuster, Messrs. Lott and Beasley, each amply provided with assistants.

"The Committee decided that at both stations the observations should be mainly photographic; and the instruments furnished had for their object the registration of the violet spectrum of the corona and chromosphere as a whole, and that of the spectrum of an isolated portion of the image.

"Ordinary photographs of the corona and of the polariscopic effects of its light were also provided for.

"In spite of the most hopeful anticipations, the weather at Camorta proved bad on the morning of the eclipse, and, as has been observed on former occasions, the reduction of the temperature, due to the withdrawal of the sun's heat, produced a mass of cumulus cloud which prevented a most thoroughly equipped party from making any observations whatever during totality.

"The success of the Siam party has been also far less than was anticipated. An unfortunate break-down in the Suez Canal, and some misunderstanding, in consequence of which the promised Government steamer was not forthcoming, caused delays which left so little time for the final adjustment of the instruments when the observers at last reached their station, that some records are altogether wanting; and the attempt to photograph the spectrum of an isolated portion of the chromosphere proved a failure.

"The most important results obtained are (1) a series of photographs of the corona, taken with a prism of small angle in front of the object-glass, which show several rings and part of the form of the outer corona; and (2) a series of views of the corona, ceiefly taken at different times of exposure. The discussion of the observations has not yet been taken in hand; but it is not too early to state that several results of great interest and value have been secured.

"The King of Siam himself made a sketch of the corona and forwarded it to the Society. In common with others which accompany the reports, it does not differ very greatly from the figure photographed on the plate.

"I cannot conclude this short reference to one branch of our activity during the past session without congratulating English Science upon the fact that the eclipse was not suffered to pass unobserved, and without expressing our obligations to all those whose names will be mentioned at length in the report, who both here and abroad at each stage of the arrangements afforded us valuable assistance, not forgetting the observers themselves, who in the service of science volunteered for a duty not without risk, and from the performance of which, indeed, some have suffered in health."

Dr. Hooker next referred to the *Challenger* expedition, and to the interesting discoveries "which seem literally to have crowded along the course of the vessel." He referred to the light thrown by the *Challenger* researches on the formation of azoic clays and schists, on submarine geography, and on the distribution of pelagic life.

"In the depths of the sea, as on the surface of the land, are contiguous areas peopled by very different assemblages of living things. As on the land we ascend to meet a colder temperature, accompanied by forms of life of wider distribution than at lower elevations, so in the seas of warm and temperate regions we descend to meet with analogous conditions. The ocean thus mirrors one of the most striking features of the distribution of terrestrial life, and, mirror-like, it turns the picture upside down. Furthermore, this analogy is confined to the warm and temperate zones of the sea; in the cold zones this order of things is reversed; there, as on land, we descend to warmer temperatures, and the deepest sea is peopled by animals proper to a much lower latitude. The total result is a uniformity in the general distribution of oceanic life that has no parallel on land; and facts in the migration of marine animals and plants that were formerly accounted for by assuming that they possessed greater powers of withstanding changes of temperature, are now accounted for by conditions more closely resembling those that obtain on the land."

Dr. Hooker then referred to the lamented death of Dr. von Willemoës-Suhm, and to the arrangement whereby Prof. Huxley has been able to act as Prof. Thomson's substitute at Edinburgh.

Speaking of the Meteorological Committeee, Dr. Hooker stated that "the anomalous connection between the Royal Society and the Meteorological Office on the one hand, and between that office and the Government on the other, is likely soon to be terminated, the Lords Commissioners of the Treasury having appointed a Committee to inquire into the working of the present office, and the value of the results hitherto obtained. According to the instructions of the Treasury, the inquiry is to be directed to two principal points of scientific interest, viz. (1) How far the statistics hitherto collected have led to the discovery or confirmation of meteorological laws. (2) How far the principles upon which storm-warnings are given have been justified by results."

While pointing out that America was in some respects more advantageously situated than England for meteorological investigation, Dr. Hooker showed that, on the other hand, England has advantages for promoting the study of terrestrial meteorology that no other country has—namely, her foreign possessions and colonies, and the command of the telegraphs with which the ocean is in process of being crossed in every direction. "We have known," he says, "what it is to read at our breakfast-tables telegrams from all parts of the world of the prices of stocks and of political incidents of the previous day; why should we not, then, obtain daily statistics of the climatic conditions of these and other remote regions, and inaugurate in England a system of meteorological registration which, if its elements were obtained from but a few well-selected spots, would instruct and interest every intelligent person in the climate of the globe, and in the end lead to scientific results of great value."

Dr. Hooker cannot but think that the Committee of the Treasury will have the opportunity of recommending to Her Majesty's Government the adoption of measures that would greatly increase the scientific efficiency and public interest of the Meteorological Office.

Dr. Hooker referred in terms of disappointment to the unexpected interpretation which has been put by the Law Lords on the terms of the Gilchrist bequest, whereby no part of it can be allotted to "the advancement of learning" *i.e.* of research, but all to the propagation of knowledge. Dr. Hooker hopes that a future and more enlightened generation "will introduce into the theory and practice of the law an interpretation of the 'advancement of learning' more in harmony with scientific ideas and the requirements of the age."

The president concluded his address by alluding to the Government Loan Collection of Scientific Instruments, which is being formed at South Kensington.

"In the proposed exhibition not only are modern scientific methods and instruments, and the various methods of practical instruction in science to be fully dealt with, but it is also proposed that the history of science shall be illustrated by the actual instruments which have been employed from the time of Galileo downwards, in those critical experiments and discoveries which mark the principal stages along the road of progress."

THE FRENCH ACADEMY AWARD OF PRIZES

AT the anniversary meeting of the Paris Academy of Sciences on Dec. 23 the following prizes were awarded as the result of the competition for 1875:—

1. Grand prize in the Mathematical Sciences, not awarded, and the subject re-set for competition in 1878—"Investigation of the elasticity of crystalline bodies from the double point of view of experiment and theory."

2. Grand prize in the Physical Sciences. The subject was, "To investigate the changes which take place in the internal organs of insects during complete metamorphoses." The prize was awarded to M. Künckel, Assistant-Naturalist at the Paris Museum.

3. The Poncelet prize, to M. Darboux, for his analytical and geometrical works.

4. The Montyon prize in Mechanics, not awarded.

5. The Plumey prize of 2,500 francs was awarded to M. Madamet, French naval engineer, for an apparatus invented by him to indicate at any moment the number of turns made by a marine steam-engine by the simple inspection of a dial, and without the need of employing a watch.

6. Fourneyron prize of 1,000 francs, to M. Sagebien.

7. The Lalande prize in Astronomy, to M. Perrotin, of the Toulouse Observatory, for his astronomical work generally, but specially for his discoveries of small planets.

8. The Lacaze prize in Physics, 10,000 francs, to Prof. Mascart, for his researches on the solar spectrum, on the measure of the dispersion of gases, on the influence which the motion of the earth has on optical phenomena, and for his investigation of the rate of light.

9. Montyon prize in Statistics, to M. Borius.

10. The Jecker prize of 5,000 francs awarded to M. Edouard Grimaux for numerous researches in Chemistry, more especially in chemical synthesis.

11. The Lacaze prize in Chemistry, 10,000 francs, to M. Favre, Dean of the Faculty of Sciences of Marseilles, for his great work on the transformation and equivalence of chemical, physical, and mechanical forces. It was while pursuing his researches in thermo-chemistry, commenced thirty years ago in conjunction with Silbermann, that M. Favre was led to investigate the great question of the equivalence of work effected by forces of different origin. M. Favre, giving an experimental demonstration of the most ingenious of Joule's views, made use of his mercury calorimeter, in the form of a thermometer in whose reservoir may be placed one or more elements. He thus established that the heat developed by resistance to the passage of electricity in the conductors of a simple voltaic couple, is simply borrowed from the total heat due to the chemical action which engenders the current; if this resistance to the passage of electricity be annulled we obtain, as the work of the pile with closed circuit, the quantity of heat which will be due to chemical action alone without the transmitted electricity.

12. The Barbier prize in Medicine, to Prof. Rigaud.

13. The Desmazières prize divided between M. Eugène Fournier, author of two memoirs on the Ferns of Mexico and of New Caledonia, and M. Emile Bescherelle, author of two memoirs on the Mosses of the same countries.

Prizes 14, 15, and 16 not awarded.

17. Grand prize in Medicine and Surgery, to M. Onimus.

18. Montyon prize in Medicine and Surgery. These prizes, of 2,500 francs each, were awarded to M. Alph Guérin, M. Legouest, and M. Magitot respectively. "Encouragements" of 1,500 francs each were awarded to M. Berrier-Fontaine, to M. Pauly, and to M. Raphaël Veyssière.

19. The Bréant prize not awarded.

20. The Godard prize in Medicine, awarded to M. Alph. Hergott.

21. The Serres prize not awarded; but a reward of 3,000 francs was given (1) to M. Campana for his researches on the anatomy and physiology of the respiratory and digestive apparatus, and of the serous membranes of birds; and (2) to M. Georges Pouchet for a MS. work on the development of the skeleton, and especially the cephalic skeleton of osseous fishes compared with that of some other vertebrates.

22. The Chaussier prize in Medicine, of 10,000 francs, divided between M. Gubler, M. Le Grand du Saulle, MM. Bergem and l'Hote, and M. Manuel.

23. The Montyon prize in Experimental Physiology, 764 francs, to M. Faivre, Dean of the Faculty of Sciences of Lyon, for his researches on the functions of various parts of the nervous system of insects. M. Faivre has established that among insects the localisation of function and the division of physiological work, are carried further than is generally supposed.

24. The Lacaze prize in Physiology, 10,000 francs, awarded to M. Chauveau, Director of the Veterinary School of Lyon, for his researches on virulent and contagious diseases. M. Chauveau has proved that the virulent activity of the vaccinal, variolar, and glanderous virus is not due to the liquid, as a whole, but oftenest to corpuscles which are held in suspension. M. Chauveau has, moreover, discovered that the agents of contagion have not only as a vehicle the liquids which come from the bodies of the sick, but that they may be transmitted to healthy animals by means of air and water. He shows that the human variola is a distinct malady by itself, of which the primary source is the organism of the horse.